WHAT IS CLAIMED IS:

1. A method for repairing a sample comprising:

generating a laser beam;

changing a phase of the laser beam to smooth the brightness distribution of the laser beam, and applying the laser beam to the sample;

acquiring an image of the sample with a Time Delay Integration (TDI) sensor, and outputting an image signal from the TDI sensor in accordance with relative movement of the laser beam and the sample;

detecting a defect of the mask pattern of the sample on the basis of the image signal output from the TDI sensor;

specifying the position of the defect of the mask-pattern on the basis of the result obtained by the detecting step; and

repairing the defect of the mask pattern.

2. A method for repairing a sample according to claim 1, wherein a signal integration time of the TDI sensor is enough for smoothing the brightness distribution of the laser beam in the step of changing.

3. A method for repairing a sample according to claim 1, wherein a laser beam source used in the generating step is a source which can continuously emit a laser beam.

4. A method for repairing a sample according to claim 1, wherein the changing step includes the step of

changing the optical axis of the laser beam against the sample continuously or intermittently to change interference fringes of the laser beam, thereby smoothing the brightness distribution of the laser beam.

5. A method for repairing a sample according to claim 4, wherein the period when the optical axis of the laser beam is changed against the sample is decided in accordance with the signal integration time of a Time Delay Integration (TDI) sensor.

6. A method for repairing a sample according to claim 1, wherein the changing step includes the step of passing the laser beam into a rotating phase shift plate which has different thickness points, to change the phase of the laser beam, thereby smoothing the brightness distribution of the laser beam.

7. A method for repairing a sample according to claim 6, wherein the rotation velocity of the phase shift plate is enough for the signal integration of the TDI sensor.

8. A method for repairing a sample according to claim 6, wherein the changing step includes the step of passing the laser beam into a plurality of rotating phase shift plates.

9. A method for repairing a sample according to claim 8, wherein the total rotation rate of the phase shift plates is enough for smoothing the brightness for the signal integration of the TDI sensor.

10. A method for repairing a sample according to claim 1, wherein the changing step includes a first step of detouring a part of the laser beam, and

a second step of detouring the part of the laser beam detoured in the first detouring step, in a different direction from the detour a first detouring step;

thereby dividing the laser beam to reduce the coherency of the laser beam and smooth the brightness distribution of the laser beam.

11. A method for repairing a sample according to claim 1, wherein the changing step includes a first step of detouring about one-half of the laser beam, and

a second step of detouring the half of the laser beam detoured in the first detouring step, in a direction inclined at 90 degrees against the detour direction in the first detouring step;

thereby dividing the laser beam into four beams which do not interfere with each other, to reduce the coherency of the laser beam and make uniform the brightness distribution of the laser beam.

12. A method for repairing a sample according to claim 10, wherein the path length difference between the total path length in the first detouring step and in the second detouring step and the path length of the laser beam not detoured is a coherency distance or more, thereby dividing the laser beam into four ray beams

which do not interfere with each other.

13. A method for repairing a sample according to claim 10, further including the step of providing a half wave plate for rotating, at 90 degrees, the polarized direction of a part of the laser beam, the part including the center of the laser beam, among the laser beams which have been via the second detouring step.

14. A method for repairing a sample according to claim 13, wherein a prism with a wedge form is provided in the front or in the rear of the half wave plate.

15. A method for repairing a sample according to claim 1, further including the step of outputting the image signal output from the TDI sensor after correcting the image signal by use of a correction coefficient associated with a line width of the mask pattern of the sample.

16. A method for repairing a sample according to claim 1, wherein in the detecting step, the image signal output from the TDI sensor is compared with reference data which is read out, to thereby detect whether or not the mask pattern has a defect.

17. A method for repairing a sample according to claim 16, further including the step of detecting a relative speed of the sample to the TDI sensor, and correcting timing at which the reference data is read out, in accordance with the relative speed.

18. A method for inspecting a sample, comprising:

generating a laser beam;

changing a phase of the laser beam to smooth the brightness distribution of the laser beam;

applying the smoothed laser beam to the sample;

acquiring an image of the sample using a Time Delay Integration (TDI) sensor while the laser beam and the sample are relatively moved; and

examining the image of the sample for a defect of the mask-pattern of the sample.

19. A method for inspecting a sample according to claim 18, wherein a signal integration time of the TDI sensor is enough for smoothing the brightness distribution of the laser beam in the step of changing.

20. A method for inspecting a sample according to claim 18, wherein the laser beam used in the generating step is a source which can continuously emit a laser beam.

21. A method for inspecting a sample according to claim 18, wherein the changing step includes the step of changing the optical axis of the laser beam against the sample continuously or intermittently to change interference fringes of the laser beam, thereby smoothing the brightness distribution of the laser beam.

22. A method for inspecting a sample according to claim 21, wherein the period when the optical axis of the laser beam is changed against the sample is decided

in accordance with the signal integration time of the TDI sensor.

23. A method for inspecting a sample according to claim 18, wherein the changing step includes the step of passing the laser beam into a rotating phase shift plate which has different thickness points, to change the phase of the laser beam, thereby smoothing the brightness distribution of the laser beam.

24. A method for inspecting a sample according to claim 23, wherein the rotation velocity of the phase shift plate is enough for the signal integration of the TDI sensor.

25. A method for inspecting a sample according to claim 23, wherein the changing step includes the step of passing the laser beam into a plurality of rotating phase shift plates.

26. A method for inspecting a sample according to claim 25, wherein the total rotation rate of the phase shift plates is enough for smoothing the brightness for the signal integration of the TDI sensor.

27. A method for inspecting a sample according to claim 18, wherein the changing step includes a first step of detouring a part of the laser beam and

a second step of detouring the part of the laser beam detoured in the first detouring step, in a different direction from the detour of the first detouring step;

thereby dividing the laser beam to reduce the coherency of the laser beam and smooth the brightness distribution of the laser beam.

28. A method for inspecting a sample according to claim 18, wherein the changing step includes a first step of detouring about one-half of the laser beam, and

a second step of detouring the half of the laser beam detoured in the first detouring step, in a direction inclined at 90 degrees against the detour direction in the first detouring step;

thereby dividing the laser beam into four beams which do not interfere with each other, to reduce the coherency of the laser beam and uniform the brightness distribution of the laser beam.

29. A method for inspecting a sample according to claim 27, wherein the path length difference between the total path length in the first detouring step and in the second detouring step and the path length of the laser beam not detoured is a coherency distance or more, thereby dividing the laser beam into four ray beams which do not interfere with each other.

30. A method for inspecting a sample according to claim 27, further including the step of providing a half wave plate for rotating, at 90 degrees, the polarized direction of a part of the laser beam, the part including the center of the laser beam, among the laser beams which have been detoured via the second

detouring step.

31. A method for inspecting a sample according to claim 30, wherein a prism with a wedge form is provided in the front or in the rear of the half wave plate.

32. A method for inspecting a sample according to claim 18, further including the step of outputting the image signal output from the TDI sensor after correcting the image signal by use of a correction coefficient associated with a line width of the mask-pattern of the sample.

33. A method for inspecting a sample according to claim 18, wherein in the examining step, a signal output from the TDI sensor is compared with reference data which is read, to thereby detect whether or not the mask pattern has a defect.

34. A method for inspecting a sample according to claim 33, further including the step of detecting a relative speed of the sample to the TDI sensor, and correcting timing at which the reference data is read, in accordance with the relative speed.

35. A method for manufacturing a photomask comprising:

forming a pattern onto the photomask;

generating a laser beam;

changing a phase of the laser beam to smooth the brightness distribution of the laser beam, and applying the smoothed laser beam to the photomask;

acquiring an image of the photomask with a TDI sensor as the laser beam and the photomask are moved relatively;

acquiring a defect of the mask-pattern of the photomask on the basis of the image of the photomask; and

when the defect of the mask-pattern is detected, specifying the position of the defect of the mask pattern, and repairing the defect of the mask pattern.

36. A method for manufacturing a photomask according to claim 35, wherein a signal integration time of the TDI sensor is enough for smoothing the brightness distribution of the laser beam in the step of changing.

37. A method for manufacturing a photomask according to claim 35, wherein a laser beam source used in the generating step is a source which can continuously emit a laser beam.

38. A method for manufacturing a photomask according to claim 35, wherein the changing step includes the step of changing the optical axis of the laser beam against the sample continuously or intermittently to change interference fringes of the laser beam, thereby smoothing the brightness distribution of the laser beam.

39. A method for manufacturing a photomask according to claim 38, wherein the period when the

optical axis of the laser beam is changed against the photomask is decided in accordance with the signal integration time of a Time Delay Integration (TDI) sensor.

40. A method for manufacturing a photomask according to claim 35, wherein the changing step includes the step of passing the laser beam into a rotating phase shift plate which has different thickness points, to change the phase of the laser beam, thereby smoothing the brightness distribution of the laser beam.

41. A method for manufacturing a photomask according to claim 40, wherein the rotation velocity of the phase shift plate is enough for the signal integration of the TDI sensor.

42. A method for manufacturing a photomask according to claim 40, wherein the changing step includes the step of passing the laser beam into a plurality of rotating phase shift plates.

43. A method for manufacturing a photomask according to claim 42, wherein the total rotation rate of the phase shift plates is enough for smoothing the brightness for the signal integration of the TDI sensor.

44. A method for manufacturing a photomask according to claim 35, wherein the changing step includes a first step of detouring a part of the laser beam, and

a second step of detouring the part of the laser beam detoured in the first detouring step, in a different direction from the detour a first detouring step;

thereby dividing the laser beam to reduce the coherency of the laser beam and smooth the brightness distribution of the laser beam.

45. A method for manufacturing a photomask according to claim 35, wherein the changing step includes a first step of detouring about one-half of the laser beam, and

a second step of detouring the half of the laser beam detoured in the first detouring step, in a direction inclined at 90 degrees against the detour direction in the first detouring step;

thereby dividing the laser beam into four beams which do not interfere with each other, to reduce the coherency of the laser beam and make uniform the brightness distribution of the laser beam.

46. A method for manufacturing a photomask according to claim 44, wherein the path length difference between the total path length in the first detouring step and in the second detouring step and the path length of the laser beam not detoured is a coherency distance or more, thereby dividing the laser beam into four ray beams which do not interfere with each other.

47. A method for manufacturing a photomask according to claim 44, further including the step of providing a half wave plate for rotating, at 90 degrees, the polarized direction of a part of the laser beam, the part including the center of the laser beam, among the laser beams which have been detoured via the second detouring step.

48. A method for manufacturing a photomask according to claim 47, wherein a prism with a wedge form is provided in the front or in the rear of the half wave plate.

49. A method for manufacturing a photomask according to claim 35, further including the step of outputting the image signal output from the TDI sensor after correcting the image signal by use of a correction coefficient associated with a line width of the mask pattern of the photomask.

50. A method for manufacturing a photomask according to claim 35, wherein in the detecting step, the image signal output from the TDI sensor is compared with reference data which is read out, to thereby detect whether or not the mask pattern has a defect.

51. A method for manufacturing a photomask according to claim 50, further including the step of detecting a relative speed of the photomask to the TDI sensor, and correcting timing at which the reference data is read out, in accordance with the relative speed.

52. A method for manufacturing a semiconductor device by using a photomask after inspecting the photomask, comprising:

generating a laser beam;

changing a phase of the laser beam to smooth the brightness distribution of the laser beam;

applying the smoothed laser beam to the photomask;

acquiring an image of the photomask using a Time Delay Integration (TDI) sensor while the laser beam and the photomask are relatively moved; and

examining the image of the photomask for a defect of the mask-pattern of the photomask.

53. A method for manufacturing a semiconductor device by using a photomask after manufacturing the photomask, comprising:

forming a pattern onto the photomask;

generating a laser beam;

changing a phase of the laser beam to smooth the brightness distribution of the laser beam, and applying the smoothed laser beam to the photomask;

acquiring an image of the photomask with a TDI sensor as the laser beam and the photomask are relatively moved;

acquiring a defect of the mask pattern of the photomask on the basis of the image of the photomask; and

when the defect of the mask pattern is detected,

specifying the position of the defect of the mask pattern, and repairing the defect of the mask pattern.

54. A method for inspecting a sample, comprising:

an illumination step of irradiating a sample with a laser beam while changing a phase of the laser beam with time, thereby permitting brightness on the sample to vary with time;

an image formation step of acquiring an image of the sample, using a sensor placed on an image plane of the sample; and

an image processing step of processing signals obtained by the sensor, so as to inspect a pattern of the sample.

55. A method according to claim 54, wherein in said image formation step, an image or a brightness signal relating to a desired portion of the sample is obtained by moving an illuminating beam and the sample relative to each other, or a two-dimensional image is obtained by use of a sensor wherein elements are arranged in two dimensions.